

# Chemical Agent Resistant Coating

1985

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**A Safety Support Pamphlet**



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CHEMICAL

AGENT

RESISTANT

COATING

A SAFETY SUPPORT KIT

## Industrial Safety Fact Sheet

SUBJECT: Accident Prevention in Chemical Agent Resistant Coating (CARC) Operations

1. The National Safety Council estimates that the value of goods and services each worker must produce to offset the cost of work injuries is \$350. Work injuries in the United States cost more than \$37 billion. In 1985, more than 13 percent of all accidents or 9 million injuries occurred in industrial places according to the National Health Review Survey.
2. Injuries, death, and disability are results of accidents. Costs combined with worker pain, disability, and loss of life emphasize the importance of accident prevention on all levels of industrial maintenance operations.
3. Accidents from the handling, storage, and application of chemical agent resistant coating (CARC) operations are numerous and can occur at any level, from organization through IMDS/IMGS (depot) level maintenance; for example, failure to use protective equipment and lack of knowledge involving proper handling, storage, and characteristics of various solvents and paint components used in the workplace.
4. Use of protective equipment, familiarity with hazardous materials data sheets on each chemical, following manufacturers' instructions, compliance with safety and OSHA requirements, teamwork, and individual awareness are necessary for effective control of hazardous conditions to prevent disabling injuries and death.
5. Good judgment and proper supervision of subordinates are instrumental in accident prevention. Incidents of skin irritation, inhalation of hazardous vapors from solvents, paint, chemical reactions from improper mixing, solvent decomposition, paint solvent fires, blindness, etc., can be avoided by becoming aware of the hazard, controlling the hazard, minimizing the exposure to the hazard, using protective equipment, analyzing job processes for safety features, and by simply following the rules. No one can prevent accidents like you can.

CHEMICAL AGENT  
RESISTANT COATING

CARC

SAFETY TAILGATE SESSIONS  
FOR HANDLERS

## Tailgate Sessions

### Short Safety Briefings for Maintenance Personnel Performing CARC Painting Operations

What is a tailgate session? Tailgate sessions got their name from employees sitting on the tailgate of a truck while receiving a short safety briefing for an upcoming job.

The use of this type training for maintenance personnel has obvious advantages:

- . It shows safe performance is one of the work standards.
- . It allows sharing of safety information about upcoming jobs.
- . It can be done with minimal planning during nonpeak work hours.
- . It shows supervisory support of safe activities.
- . It can be keyed to specific individuals or work groups without requiring entire unit participation.
- . It lends authenticity to the safety program by keying on the job at hand and therefore avoids generalization.
- . It raises safety awareness level of personnel.

#### Implementation

- . Identify topics that are pertinent to the unit's maintenance activities (see list of additional tailgate topics for recommendations).
- . Develop hip-pocket tailgate sessions on selected topics.
- . Distribute tailgate sessions to supervisors and discuss when and where they are to be used (sessions are included in this kit).
- . Have individuals from the command group or element occasionally conduct tailgate sessions to reiterate and reinforce their concern for safety.
- . Continually revise and update the tailgate sessions to ensure applicability.

## CARC HAZARDS

Personnel should be familiar with emergency and first aid procedures as outlined in the material safety data sheet. This includes medical information to follow if the product is inhaled, ingested, or comes in contact with eyes and skin.

Most paints of this type are considered flammable liquids and should be kept away from sources of heat, spark, and open flame. In paint spraying operations, only the amount needed for one day of work should be present at the work site. Storage should be in approved cabinets for flammable materials or in outside flammable material storage areas. Smoking, sparks, and open flames should be prohibited in these areas.

The most common health hazards involved with overexposure to CARC paint are irritation of the respiratory tract, nervous system depression, headache, dizziness, unconsciousness, coma, and allergic sensitivity. Chronic exposure may result in asthma-like respiratory disease and symptoms of overexposure are often delayed. Personnel known to be allergic to isocyanates should not paint with polyurethanes.

Anyone using polyurethanes more than 30 working days per year should be provided preplacement (before the job) medical surveillance. This surveillance should include: occupational and medical histories with exposure to isocyanates, organic solvents, and lead; a history of allergies; skin, blood, heart, urinary, and respiratory monitoring; a physical exam and chest X-ray; complete urinalysis; a blood-lead determination; a blood test of liver function; EKG (for personnel over 40); and proof of the ability to safely wear a respirator. Ongoing medical screening for current workers should be in accordance with regulatory requirements.

## PROTECTIVE EQUIPMENT AND RESPIRATORY PROTECTION

Clothing used when performing CARC painting operations should provide full skin coverage. This will prevent unnecessary skin exposure to irritating chemical components of the paint. Rubber aprons and impervious rubber gloves should also be used when spills or splashing may occur. When handling thinners, paints, or solvents, or while using respirators not equipped with eye protection, safety eyewear with side shields and splash guards should be used.

Guidelines for PPE and respirator use in painting operations are found in U.S. Army Environmental Hygiene Agency Technical Guide No. 144, "Guidelines for Controlling Health Hazards in Painting Operations," August 1987. OSHA regulations for respirator use may also be found in 29 CFR 1910.134. According to Technical Guide No. 144, Nov 87, an approved pressure demand or continuous flow, Type C, full-facepiece hood or helmet supplied-air respirator OR an approved pressure demand or continuous flow, Type C, full-facepiece supplied-air respirator with auxiliary self-contained air supply is required for confined spaces. Outdoor use also requires a supplied-air respirator for paint, enamel mists, and organic vapors. However, alternatives are permitted when authorized by preventive medicine personnel. TB Med 502 covers the maintenance and care of all types of respirators. A respirator will not function indefinitely without cleaning and upkeep for continued protection. Additional guidance from Technical Guide No. 144 on respirator requirements in support of Army painting may be found in this kit.

An important means of self-protection is the practice of personal hygiene. Contaminated clothing should be removed and washed prior to reuse. Workers performing painting operations or handling materials used in these processes should always wash hands before eating, smoking, or using the washroom. Never eat in the work area where food can become contaminated. Smoke in designated areas only.



## CLEANING SURFACE TO BE PAINTED

Surfaces to be painted must be thoroughly cleaned. All rust, corrosion, oil, grease, moisture, dirt, loose and blistered paint, and other surface contaminants must be removed prior to performing any repainting operations.

The major methods for preparing the surface for repainting and for removing old surfaces are abrasive sanding and solvent cleaning. Light sandblasting and orbital sanding of old paint must be accomplished carefully. Concerns must be focused upon the possibility that the old coating may contain particles of heavy metals such as zinc chromate and lead. It does not matter if the old surface is CARC, alkyd, or lacquer. Sanding and abrading of any coating suspected to contain heavy metal particles should be accomplished while using an approved toxic dust respirator.

Welding and cutting on items painted with any type of paint should not be done until paint has been abraded to the bare metal. This includes abrading the backside if it has been painted. If you use a torch to burn off old paints, you are putting pigment metals and binder fumes into the air. These may be harmful.

Surfaces intended for CARC application should be solvent cleaned with materials conforming to MIL-T-81772 or TT-T-291. Protective equipment used will be adequate to protect the worker from hazards involved with the handling and exposure to the solvent used in the operation.

## WHAT IS CARC PAINT?

CARC, Chemical Agent Resistance Coating, is basically a durable polyurethane paint used on the outside of Army materiel. It is important to the Army for two basic reasons. First, it should reduce the number of times that vehicles must be painted. Second, chemical agents are not absorbed into the paint and this means that battlefield decontamination time is greatly reduced. The majority of chemical contamination can be removed by simply hosing down the vehicle with water.

The two-package polyurethane paint (MIL-C-46168) used by the Army is capable of being sprayed or brushed. Component A contains polyesters, pigments, and other additives; and component B contains aliphatic polyisocyanates. It is the polyurethane outer coating which this packet addresses. This topcoat is used over an epoxy primer and comes in different types. The latest specification requires lead- and chromate-free formulations. Some require the use of solvents such as 1.1.1 Trichloroethane.

The other form of CARC paint in use is the one-component-type Military Specification MIL-C-53039. This one-component paint varies from the two-component variety in that it does not require a catalyst component prior to use. This paint is lead- and chromate-free.

Military CARC painting normally requires a number of steps in the finishing process depending on the particular paint used and the type of surface to be painted. The most common steps are: (1) cleaning of the surface, (2) pretreatment, (3) priming, and (4) finish coat with CARC polyurethane paint.

A material safety data sheet, prepared by the manufacturer, is to accompany each shipment of paint. This document covers information such as the product's hazardous ingredients, fire and explosion data, reactivity data, spill and disposal procedures, health hazards, and specific protection information. It is mandatory that this information is read by all paint application personnel as required in TM 43-0139. These data sheets should be available to all personnel at the work site, as required by OSHA Standard 29 CFR 1910.1200.

## PRETREATMENT OF SURFACE TO BE PAINTED

### PRIMING OPERATIONS

Bare metal surfaces to be painted with CARC coatings will be coated immediately after cleaning with pretreatment or wash primer. Pretreatment primer is used as a bonding agent and to provide temporary protection from corrosion. In general, it may be applied to all bare surfaces, both interior and exterior. Several companies produce primers suitable for use in CARC operations and all of them have hazardous contents.

Both the epoxy primer and the activator can hurt you if you breathe a lot of vapors. Some chemicals can be absorbed through the skin and affect the central nervous system through inhalation. The primer doesn't have all of the toxic chemicals found in the CARC system color coats. Nevertheless, you should use the respirator provided, clean coveralls, eye protection, and rubber gloves to keep the liquid from irritating your face and body.

Zinc chromate is contained in some primers used on aircraft. Exposure to this primer has several risks, such as an increased risk of cancer due to the chromium content. When painting outside, always wear protective equipment and stay upwind of the area being painted.

There are other primers in use which vary in chemical content and associated hazards. Always be familiar with the manufacturer's material data sheets and wear required protective equipment. One aspect all paint primers have in common is that they are generally flammable materials. They should be kept away from sources of heat, sparks, and open flames. Storage facilities should be proper for paints and flammable materials whether in inside approved storage cabinets or in outside storage areas.

As per TM 43-0139, only intermediate general support and depot level personnel are authorized complete painting and repainting of component with topcoats and primers. Unit and intermediate direct support level personnel are only permitted to use topcoats and primers for touchup efforts.

## CARC FINISH COAT

A big problem in handling CARC paint mixtures is knowing how to properly mix the paint and the proper thinning materials to use. Certain paints can only be mixed with certain thinners. Use of an improper thinner may lead to chemical reactions and instability. For this same reason, components of different colors are not interchangeable. Component A of one color may not be used with component B of another color. Components from different manufacturers cannot be mixed.

The local safety office and preventive medicine support activity must be consulted prior to initial CARC painting. Use impervious gloves, not cloth, when mixing CARC. Do not use without adequate protection against skin and eye contact and vapor inhalation. Always be sure to read the materials data sheet and manufacturer's instructions before using PUP. Do not apply CARC to heated items such as manifolds and mufflers that exceed 400 F. Excessive heat and the burning of paint causes toxic chemicals to be released into the air.

Unused CARC cannot be stored after mixing and must be disposed of in accordance with Federal, state, DOD, and DA hazardous waste regulations. This also goes for PUP component B if it goes bad. It should be clear to pale yellow in color. If it thickens and appears crystalline in consistency, seal it back up and get rid of it as hazardous waste. If a PUP component B container is swollen, don't open it. Turn it in as hazardous waste. Consult your local installation environment office for proper disposal guidance.

CARC has a flashpoint of approximately 38 F, and is highly flammable. It must be handled and stored as such. Spray booth operations must meet OSHA standards to include grounding of equipment. Electric tools such as drills that are used to stir paint in metal cans must also be grounded.

SAFETY CHECKLIST FOR  
CARC PAINTING OPERATIONS

### Checklist for CARC Painting Operations

1. Are materials safety data sheets available and read by all personnel?  
(29 CFR 1910.1200 and TM 43-0139)
2. Are respirators worn and maintained in all operations requiring their use and are personnel trained in proper use? (29 CFR 1910.134 and TB Med 502)
3. Are all flammable materials kept in approved flammable storage areas?  
(29 CFR 1910.106(d)(3-6))
4. Are only approved solvents used in cleaning equipment? (Gasoline and other associated flammables are not authorized.) (29 CFR 1910.107(g)(5))
5. When using compressed air for cleaning purposes is the pressure reduced to less than 30 psi and are chip guarding and protective goggles/equipment used?  
(29 CFR 1910.242(b))
6. Is protective equipment suitable to minimize the hazards encountered by the worker? (29 CFR 1910.132)
7. Are procedures and protective equipment monitored by an industrial hygienist to ensure adequate worker protection? (29 CFR 1910.1000)
8. Is proper medical screening accomplished on all personnel prior to employment in the CARC painting area? (AR 40-5 and TM 430-139, para 3-19(b))
9. Are impervious (not cloth) gloves used when mixing or applying CARC and are workers adequately protected against skin contact and vapor inhalation? (TM 43-0139, para 2-31(b)(4))
10. Is unusable CARC mixture disposed of and handled as hazardous waste?  
(TM 43-0139, para 2-31(b)(4))
11. Are the local safety office and preventive medicine activity consulted prior to initial CARC application? (TM 43-0139, para 2-31(b)(4))
12. Are personnel aware that PUP component of different colors are not interchangeable and the PUP components from different manufacturers are not interchangeable? (TM 43-0139, para 2-31(b)(4))
13. In spray painting operations are unprotected personnel kept at least 50 feet away from spray area until at least 30 minutes after cessation of painting operations? (TM 43-0139, para 1-3b)
14. Does only one person perform spray paint operations at a time?  
(TM 43-0139, para 1-3b(1))
15. Is all electrical equipment properly grounded before starting any painting operation? (TM 43-0139, para 1-3b(6))

16. Are unit and intermediate direct support level personnel aware that they are permitted to use CARC topcoats and primers for touchup efforts only? (TM 43-0139, para 3-12f)
17. Are personnel aware that CARC should never be painted on surfaces such as manifolds, mufflers, and other areas which heat to an excess of 400 F? (TM 43-0139, para 3-12d)
18. Do spray booths meet the construction criteria in 29 CFR 1910.107(b)?
19. Are all electrical fixtures grounded and are lighting and ventilation fixtures and motors explosion proof in spray booth areas? (29 CFR 1910.107(c))
20. Are spray areas cleaned often to remove flammable residue and are only nonsparking scrapers and tools used for this procedure? (29 CFR 1910.107(g)(2))
21. Do solvents used for cleaning the spray booth have a flashpoint of 100 degrees F and above? (29 CFR 1910.107(g)(5))
22. Are metal waste cans used to store rags contaminated with CARC residue and thinners? Are these cans dumped at least daily? (29 CFR 1910.107(g)(3))
23. Are quantities of flammable and combustible liquids kept in the vicinity of spray operations limited to the minimum amount necessary to perform one day/one shift of work? (29 CFR 1910.107(e)(2))
24. Are all sources of heat, spark, static, and open flame away from CARC paint area? (29 CFR 1910.107(c))

SAMPLE SOP FOR  
CARC HANDLING, STORAGE, AND  
APPLICATION OPERATIONS



NAME OF OFFICE

STANDING OPERATING PROCEDURE NO. \_\_\_\_\_

DATE \_\_\_\_\_

CARC Painting Operations, Storage, and Handling

1. Purpose. To establish safe operating procedures and assign responsibilities to cover CARC paint handling, storage, and application operations.
2. Applicability. This procedure applies to the handling, storage, and application of chemical agent-resistant coating (CARC) and associated solvents and thinners.
3. Responsibility. The immediate supervisor is responsible for:
  - a. Application and enforcement of this procedure.
  - b. Ensuring that only qualified personnel are permitted to engage in CARC handling and application operations.
  - c. Ensuring that the building leader and subordinates are thoroughly briefed regarding the requirement that only authorized personnel are allowed to engage in these operations.
  - d. That CARC application and handling is limited to that allowed by regulation. Unit and intermediate direct support activities are allowed to perform touchup work only. CARC painting of the entire vehicle is authorized only at the intermediate general support and depot levels.
4. Location of operations. Building \_\_\_\_\_.
5. Material limits. The amount of paint operations performed and material on hand will be limited to the number and quantity needed to perform the job safely and efficiently.
6. Personnel limits. The number of personnel exposed to CARC paint and associated hazards will be the minimum required to safely perform the operation.
7. Safety requirements. Industrial requirements include those below:
  - a. Materials safety data sheets will be obtained from the manufacturer and/or hazardous materials microfiche on all chemicals used within the operation. Chemicals without this information will not be used until this information has been procured and coordination with the industrial hygienist has been accomplished. All personnel involved in paint mixing and applications are required to read these data sheets prior to performing these duties.
  - b. Personnel will be aware of and trained in the hazards of all chemicals used and personnel protective equipment maintenance.
  - c. Smoking, spark, and open flames will not be permitted in any paint storage, mixing or application area.

d. Industrial hygienists will monitor worker exposure and suitability of protective equipment. Personnel will be medically screened before being placed in CARC application positions and will be subject to medical surveillance while performing these duties.

e. Paint spray equipment, grounding systems, electrical systems, and storage facilities will be periodically inspected to ensure safe operation and OSHA compliance. Deficiencies will be corrected as soon as possible.

f. Personnel will only use solvents and thinners approved for use with the particular component they are using. Components from one color PUP will not be mixed with components from another color. Components from one manufacturer will not be mixed with that of another manufacturer.

g. Personnel will be trained in fire prevention techniques and proper methods for cleaning up spills and waste disposal. Waste CARC will not be dumped into sewage or drainage systems.

h. Rags contaminated with flammable residue will be stored in approved metal cans which are emptied daily. Storage of paint and associated flammables will be in approved cabinets or storage areas away from heat, sparks, and sources of ignition. Smoking will not be allowed in any area involving mixing or storage of flammables.

i. Personnel will be provided protective equipment and these items will be worn. Ventilation will be adequate and all protective equipment will be maintained in a proper manner.

j. For all unenclosed areas, all unprotected personnel will not be within 50 feet of a CARC spray operations while operation is ongoing. Unprotected workers will not enter the area until at least 30 minutes after operation has ceased.

#### 8. CARC operations.

a. All eating and smoking is prohibited in the CARC application area.

b. Personnel will be well trained in safe procedures, fire prevention, and the hazards of each material used. Protective equipment and ventilation will be adequate for the operation involved.

c. Only approved methods of disposal will be authorized.

9. Posting. After this sample SOP has been developed and approved by the concerned command, a copy should be posted in an area accessible to all employees.

SUBMITTED BY: \_\_\_\_\_

RECOMMENDING APPROVAL: \_\_\_\_\_

APPROVAL: \_\_\_\_\_

REMEMBER: ACCIDENTS ALWAYS HAPPEN TO THE "OTHER GUY." TO EVERYONE ELSE, YOU  
ARE THE OTHER GUY. NO ONE CAN PREVENT ACCIDENTS LIKE YOU CAN.

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### List of Additional Tailgate Topics

Inspection of Lifting Devices IAW TB 43-0142

Submitting DA Form 2028 on TM

Submitting QDR/EIR On Equipment and Tools

Unit SOP Requirements (DA Pam 750-35)

Necessity for Inspection of Components

Ignition Lockout Procedures

When and When Not To Improvise

Using TMs—How to Get, Use, Change (DA Pam 25-30)

Ground Guides In and Around Motor Pool, Track Park, and Maintenance Shop

Prejob Checks

Checking Security of Equipment on Jack Stands

Afterjob Checklists

How to Inspect Tools

Fire Prevention

Flammable Material Safety

CARC HAZARDOUS MATERIALS  
SAFETY BRIEFINGS FOR USE BY THE SUPERVISOR

CARC Paint Systems, Parts A and B  
(Various)  
MIL-C-46168D

Several manufacturers make ingredients for the chemical agent resistant coating (CARC) systems. All CARC products must meet the requirements of military specification, MIL-C-46168D, but the specification allows different pigments and materials to be used. Many of the chemicals are real threats to the health of unprotected users. Some contain dangerous components such as the one called HDI. It makes up only a small part of the final mixture. However, we use a lot of paint with HDI on our vehicles and equipment. Therefore, painters can be exposed to disabling amounts of the chemical in the course of a year.

All colors of the coating system consist of two parts. For that reason it is called a system instead of just paint. Parts A and B must be kept separate until it is time to start the job. There is also a special kind of thinner to be used for spraying and cleanup. I'll talk about that later.

HDI stands for "Hexamethylene diisocyanate." You don't have to know how to spell it, but you have to know that breathing it is detrimental. HDI is less than 1 percent of the coating mixture. The vapors cause irritation of your breathing passages and lungs. The reaction can be delayed. It might affect you at night after a day's work. Long-term over-exposure results in an asthma-like respiratory disease.

Different camouflage paints get their colors from different metal pigments. If they are inhaled or swallowed, some of them will cause health problems. The metals can build up in your body over time, causing a long, slow poisoning. A short exposure to very high levels will also bring on faster damage to your nerves and other tissues.

The solvents in the paint give you a warning: a noticeable odor similar to alcohol or ether. That is good news and bad news since the solvents themselves are a health hazard. Overexposure can bring on a drunk-like high, causing staggering and the loss of coordination, creating a second danger of blundering into a moving truck or track. Driving a vehicle is definitely out of the question. Getting the solvent out of your system takes a long rest in fresh air. If you stay in the vapors, you could inhale enough to go into a coma and maybe stop breathing.

It sounds as though I am trying to scare you away from the mission, but I'm not. No material that has been made can hurt you if you use it correctly. The trick is to know how to protect yourself; then follow the rules. You can figure out that you have to keep some kind of barrier between yourself and the CARC paints. Eyeshields and gloves might be the first things you think of, but the most important protection is the correct respirator. It will keep the spray and vapors out of your lungs.

Both you and I know that equipment fails and rules are broken. When either happens often enough, someone gets a dose they cannot handle. First aid will depend on how much poison gets to the painter through what route. A breathing overdose can kill someone, so it must be handled immediately. Get a victim to fresh air and apply artificial respiration if breathing has stopped. In any medical emergency don't be shy about calling for the medics. Look for signs of exposure in yourself and your buddies. The most common first aid emergency involves eye contamination. The irritation it causes is painful so the victim will have trouble finding the eyewash fountain. Use a large but gentle stream of water to flush the eyes and keep washing for at least 15 minutes. No matter how stupid it sounds, believe me when I tell you that people manage to drink things like camouflage paint. If it happens to someone you know, the best thing you can do is keep him or her calm and get medical help fast. Tell the doctors what was swallowed and follow their instructions.

In addition to their health hazards, both parts A and B liquids can cause a fire or explosion. They are more flammable than kerosene but not as easy to ignite as gasoline. Once they turn into vapor, as in "empty" containers or in the spray zone, a small spark is enough to set off a fire. For that reason, there will be no smoking in the work area and containers will be electrically bonded and grounded before you start a pour. If a fire does start, it will give off extremely dangerous smoke. The best course of action is to call the firemen at once, then evacuate any equipment that is threatened. A paint fire will get away from you quickly so don't go in for heroics.

The same idea applies to any large spill that you cannot easily wipe up. Try to contain the flow without getting exposed to the vapor. Evacuate unneeded people and call for help from the fire department or the engineer's response team.

## Epoxy Primers for CARC Paint System (Various Vendors)

Before applying chemical agent-resistant paint to bare metal, you must prepare the surface with a primer coat. Several companies supply primers, and all of them have hazardous contents. If you do not take proper precautions you might be exposed to chemicals that cause long-term health problems or a sudden medical emergency.

Both the epoxy primer and the activator can hurt you if you breathe a lot of their vapors. If any vapor gets in your eyes or on your skin it will cause a more or less painful irritation.

Breathing a heavy concentration of primer vapors affects your nervous system--causing headache, drowsiness, and confusion. Staying in high levels of vapor for a long enough time could put you into a coma. If you get to fresh air, the problems will clear up. Unless you feel normal immediately, go to the health clinic for an examination.

Usually, you think about a chemical hazard as a problem in using a new material. Applying fresh primer presents some hazards but so does working old coatings. If you use a torch or burn off old paints, you are putting a lot of the pigment metals and binder fumes into the air. If you use a power sander, a large amount of the old coating turns into particles that you could breathe or swallow. Avoid burning old paint, especially if you do not know the history of the various coats. Always wear a respirator mask when using abrasive machinery to prepare a clean surface.

Chemical agent-resistant paint requires the use of respirators to protect your lungs. In some cases, you will need a respirator that provides its own supply of fresh air, which holds true even when normal spray booths are available. The primer does not have all of the toxic chemicals that are in the CARC system color coats. Nevertheless, you should use the respirator that is appropriate. Clean coveralls, eye protection, and gloves keep the liquid from irritating your face and skin.

You should know some simple first aid in case someone is overexposed to the primer. Inhaling too much vapor is usually the most serious occurrence. The important step is to get the person away from the chemical that is causing the problem. Remove a groggy or unconscious victim from the spray area. Clean air will do a lot to bring the individual back from intoxication. Large amounts of clean water will also help when a spray or splash gets into a person's eyes. Help the individual to the eyewash fountain if he or she cannot find it alone. Make sure the medical team is notified at once if anyone is injured through inhaling, ingesting, or contacting the primer.



Like other CARC camouflage paints, both primer components will burn easily if ignited. These components do not form an explosive vapor as quickly as gasoline does, but once the solvent mixes with air a dangerous blast or flash fire can occur. Of course, spraying the liquid will make an explosive cloud. The vapor is heavier than air so it will collect in pits or cellars and in poorly ventilated storerooms. Anyplace the liquid primer can evaporate must be kept clear of flames, sparks, and other sources of ignition, which include the ordinary kind of electrical equipment found in most buildings.

If we have an accident involving this primer, for example a fire or large spill, there are two important things to remember. First, call for help; second, get everybody away from the area. When that is done, you can try to control the situation with a fire extinguisher or a cleanup kit. The equipment we keep on hand is sufficient only for a very limited emergency. A paint fire is tricky because it creates dangerous smoke and small amounts of water only make matters worse. Of utmost importance is to save lives first and worry about the equipment later.

E90YY11 Zinc Chromate Primer (Yellow)  
(8010-01-118-4093)

This lesson concerns zinc chromate yellow primer in liquid form. It is used for brushing or spray painting. Similar paint is also obtained in small aerosol cans. The chemical makeup is much the same, but aerosols present added hazards from pressurized flammable vapors. The major ingredients are zinc chromate, a little lead, and a mixture of solvents that make up the liquid medium.

Part of the health hazard is irritation of the skin and breathing tract. A nervous system reaction such as drunkenness also results from exposure to the solvent. However, the really serious effects, including an increased risk of cancer, are linked to the metal content.

If you are spraying the primer, you should do so only in a paint booth or other ventilated area. Brush application is acceptable in any large area with a good flow of air. Stay upwind of the work when painting outdoors. Wear your goggles and respirator. Fresh coveralls or aprons will reduce the chance of skin outbreaks, so will gloves.

It would take a very heavy overexposure to cause you to collapse. First aid in such a case is to provide fresh air. Anytime a worker is unconscious, medical treatment is required. At least 15 minutes of washing will reduce eye injury in the event of a splash.

The primer is flammable, though not as flammable as gasoline. The primer must be kept away from heat and spark, which means you must bond and ground large containers before pouring. Use CO or dry chemical extinguishers on small fires but don't trust them to extinguish a large blaze. Call the fire department and evacuate. Be especially careful of fire around a spill. Get help from the engineers if you cannot cleanup a collection of ruptured containers.

Methylene Chloride  
(6810-00-122-3963, 8010-00-431-6213, and Others)

Methylene chloride is found in a variety of paint removers and other compounds that require a stable solvent. It is sometimes used in a pure form. Besides the usual health concerns that go with most solvents, this one has a couple of characteristics that require special attention.

It is a clear liquid with a sweet, pleasant odor, so it would be possible to swallow some. That kind of poisoning would be serious, but not very likely. Inhaling it or splashing it on the skin are more common ways of being injured by methylene chloride. Methylene chloride removes the fats and oils from your skin, causing cracking and splitting, which opens dry skin to infection. A short contact with the liquid is not usually harmful unless it gets in your eyes. Even then the irritation is more painful than damaging. Strong concentrations of the vapors in your breathing air present a more serious threat. The effects of overexposure are much like drunkenness.

One unusual hazard to be aware of is the reaction of the heart to high levels of methylene chloride in the blood. Your body changes the chemical and the result is similar to a case of carbon monoxide poisoning. This effect puts a strain on the heart which shows itself as chest pain. Remember that smokers carry a carbon monoxide load around all the time and the effects are cumulative. Good ventilation will usually keep the air in the shop clean enough, but if you have to use the solvent in a tight space, a suitable respirator will be needed. Synthetic rubber gloves and a pair of goggles will prevent any danger of contact.

First aid for excessive respiration of the vapors is to go to fresh air and settle down until the medics arrive. If breathing has stopped, perform artificial respiration. The medics should also be called in case of any eye contact with the liquid. Flush the eyes with a good flow of water until help arrives.

Under almost any working conditions, methylene chloride is not flammable; however, it needs a little care in storage. Just keep it away from oxidizers and corrosive materials. Fires that heat containers of methylene chloride can cause them to burst or release toxic gases. Even empty containers will hold enough vapors to explode if exposed to extremely high heat such as a welding torch.

If a small leak occurs, clean it up immediately. In the event of a large leak or spill, evacuate all unprotected personnel and ventilate the area. The engineers should be notified immediately so that they can respond with the proper people and equipment. Vapors from spilled material or process leaks will flow into low areas such as sumps, pits, and cellars. Anyone entering an area flooded with methylene chloride vapors would be in great danger of suffocation because all breathable air will be displaced.

117B Pretreatment Primer  
(8030-00-281-2726)

Several manufacturers produce a 2-part primer, also called wash primer, under this stock number. There is some variation in the formulas but they all meet military specification MIL-P-15328. The thin, blue liquid has an alcohol odor. In fact, a mixture of alcohols is the largest part of both the A and B components. The alcohol and other chemicals produce serious health and fire hazards.

Short-term health effects include skin irritation caused by the alcohols and the phosphoric acid content of part B. Your eyes are particularly sensitive to damage especially from the part B mixture. A level of vapor that seems irritating will also begin to have some intoxicating effects much like drunkenness. If you remain in an area contaminated with the alcohol vapors, unconsciousness will follow the dizziness and drowsiness. One major component, zinc chromate, is suspected to cause cancer in humans. Only an extremely small amount of the chromate is allowed in workplace air. Fortunately, the zinc chromate pigment does not readily become vaporized. Some mechanical action as spraying the liquid or sanding the dried coating will make a mist or dust containing the hazardous metal.

The best way to control the solvent vapors and the pigment is to keep a strong flow of air through the work site. The flow of air should carry the material away from you and lower the amount of contaminants in the breathing zone. When the job makes good ventilation impossible, you must protect yourself with a proper respirator. Goggles and gloves will prevent the irritating effects of surface contact.

Anyone who feels dizzy or sick from breathing the vapors must go immediately to fresh air. If the feeling does not pass in a minute or so, call for medical aid. In either case, let me (supervisor) know about the situation so that I can find out where the problem is originating. If you get splashed by the liquid, wash the affected area in the safety shower or eyewash fountain. The acid in the part B activator will cause a more serious burn than the part A solvents. Call the doctor any time your eyes are injured.

Because of the alcohol content, the prewash is extremely flammable. The prewash has to be kept away from sparks and flames, including the static sparks that are generated by pouring from one container to another without bonding and grounding. Store the containers in a cool location with their covers tightly closed. If a fire starts, use only dry chemical or carbon dioxide extinguishers. Remember that a hand-held extinguisher has a very limited capacity, so don't play around with a fire. It is better, in most cases, to get everybody out and call the firefighters. It is alright to extinguish a really small flareup but don't let yourself get caught or overcome by smoke.

The mixes come in containers to make either 1 gallon or 5 gallons when combined, so big spills are not usually a problem. The chances of fire increase when a couple of gallons spill, however, so be careful to shut down spark sources and evacuate anyone who is not needed for the cleanup. If you think you might need help call the engineer's spill control experts.

IS-143, Polyurethane Thinner, Aliphatic  
(8010-00-181-8079)  
MIL-T-81772

This product is the special thinner--the ONLY thinner--that is to be used with chemical agent-resistant paints (CARC). It is used for cleanup and for thinning the paint before spraying. The thinner is a clear liquid with a pleasant smell, usually delivered in 5-gallon cans. Don't let the mild odor fool you--this thinner is made up of several solvents that have to be treated with respect. It contains toluene and MEK which are used in industry under tight controls.

This thinner can do immediate damage if the exposure is strong enough. Even low levels of contact over a long time will result in chronic health problems.

The solvent will dry out the skin. The fastest way to get into trouble is by swallowing a mouthful, which is uncommon. Since it is colorless, don't ever put it in a bottle or other container that might be mistaken for a drink. If any gets in your eyes, it will be very painful, but it should not cause permanent damage if you wash the liquid out fast.

Once it enters your body, thinner acts as an intoxicating chemical with resulting headache, confusion, and loss of body control. In an extreme case, unconsciousness and breathing difficulty will occur. If you check the health hazards of the different solvents, you will find that overexposure to some of them cause permanent damage to your internal organs.

Proper respiratory protection must be worn when the thinner is used or mixed. It is usually used with the kind of paints that also have very strict requirements. The use of some kind of respirator is mandatory even when you are in a good spray booth or in the open air. The local safety or health office will make sure you get information about the right respirator for the job. Shields and goggles give good eye protection if the respirator does not have built-in lenses. Full coveralls, with sleeves secured, will limit skin exposure. Be sure to change out if you get wet in the course of a day. Gloves complete the suit.

In case there is an accident involving this thinner, get the victims out of contact, which means help them to fresh air or to an eyewash fountain. If the victims show any sign of poisoning that does not clear up immediately, get medical help. You might have to administer artificial respiration until help arrives. Let the medics know if someone swallows any thinner or shows any kind of reaction. Follow their instructions.

The solvent mix burns very easily--faster than diesel fuel. Once it has been sprayed into a mist, it quickly reaches an explosive level in air. The

area in which it is stored or used must not have any sources of flame, spark, or high heat. A carbon dioxide or dry chemical fire extinguisher is suitable for a burning liquids fire, but don't get too enthusiastic. All hand-held extinguishers have very limited capacity. Just get everybody away from the fire. Then call the firefighters, even when you think the fire has been extinguished.

Since we use cans of 5 gallons or less, large spills are not a big problem. Remember that a spill makes an instant fire hazard, so shut down the area and evacuate extra people. The cleanup crew will need respirators and spark-proof tools to contain the mess and get it back into closed containers. If several cans spill at once try to stop the spread. Call for help from the fire department or engineer's cleanup team.

Toluene  
(6810-00-290-0048, 6810-00-840-6318)

We use large amounts of toluene as a (solvent, explosive mix, etc.), but it is not authorized for thinning CARC. The material, also identified as toluol, presents a fire hazard and moderate threats to health if it is not handled properly.

The clear liquid smells a lot like gasoline and should be handled like gasoline even though it is not quite as flammable. A small fire involving toluene can be extinguished with a dry chemical or carbon dioxide extinguisher. Like other liquid fuel fires, it only spreads if hit with water. The fire department knows how to deal with such situations, so leave the heroics to them. If we're careful, we won't have to put out any fires. We can prevent them by eliminating any sparks or heat sources and storing toluene containers away from oxidizing materials. Even empty containers will retain explosive mixtures of vapor and air. They must be treated with the same respect we give any explosive. Because the vapors are much heavier than air, they will flow from a job process or an unsecured can. The presence of a flame or other ignition source anywhere the vapors might reach can cause a flashback.

In normal operations, controls keep the level of airborne vapors below the percentage that will cause a fire or a health hazard. Accidental spills, however, allow dangerous vapors to collect. Clean up small spills quickly, observing the requirements of the SOP. If you can't get it under control in a few minutes, call the spill assistance personnel at the Engineers.

Good workplace ventilation removes toluene vapors from the air, making respiratory protection unnecessary. In exceptional cases, you will be issued the proper respirator for the concentration that is present. Breathing excessive levels of toluene vapors can cause nausea and grogginess or unconsciousness. Swallowing the liquid will have the same results, with added damage to your digestive system. Prolonged contact with the skin can cause irritation and cracking. The effect on the eyes is naturally more severe. Wearing splash-proof goggles and synthetic rubber gloves reduces the hazard. In unusual situations, where you might face strong concentrations of vapor, you should get to fresh air before headaches and confusion start. In case of accidental splash, wash the eyes with large amounts of water until the medical team arrives. The health clinic must also be notified in case someone drinks the liquid. Tell them what was consumed and follow their instructions.

1,1,1 Trichloroethane  
(6810-00-K00-0354, -0356, and Others)

Trichloroethane is one of the safer industrial solvents, and is authorized only for use in Type III formulations. It has far fewer health effects than carbon tetrachloride and perchloroethylene, to which it is related. At the same time, it is highly effective as a cleaner and degreaser. Like any material, however, trichloroethane will cause injuries and damage if it is handled carelessly.

Breathing vapors of the sweet-smelling liquid can cause confusion and loss of coordination similar to drunkenness. A heavy dose will cause unconsciousness--in fact, the material was used for years as an anesthetic. Swallowing the solvent results in serious illness or death if the amount consumed is large enough. Because the vapors are much heavier than air they can collect in pits, cellars, and other low areas, which displaces the air and creates a suffocation trap. Long-term contact with the skin removes oils and fats, causing cracking and irritation. It is painfully irritating to the eyes.

All of these harmful effects are effectively controlled through work practices or the use of protective equipment. When the solvent is likely to contaminate the air, mechanical ventilation and enclosures are used. For short-term use or unusual operations, a respirator or self-contained breathing apparatus prevents inhalation of the vapor. Eye and face protection should be worn when there is any risk of splashing the liquid, and plastic gloves are available for long-term handling of wet parts. Our operations do not call for the kind of handling that requires full-coverage suits, but resistant aprons will keep the solvent from saturating your clothing.

In the event an employee accidentally gets an overdose of trichloroethane, a few ordinary first aid steps will reduce the discomfort and might prevent a serious injury. Skin or eye damage is minimized by flushing with lots of water. Fresh air will eliminate signs of intoxication. In either case, medical help should be requested.

Trichloroethane is not flammable, but it will react with strong alkalies and will break down into harmful gases if ignited. Empty containers should not be cut with a torch since high temperatures can produce an explosion. Because trichloroethane is used in large quantities there is danger of a serious leak or spill. If a spill occurs, don't breathe enough of the vapors to cause intoxication. Let the engineers contain the spill since they have the experience and the breathing equipment.



Respiratory Protection for all Paint Systems  
(Alkyd, CARC, Oil Resin, Etc.)

1. Spray Painting Indoors. An approved pressure demand or continuous flow, type C, full-facepiece hood or helmet supplied air respirator is the standard respirator to be worn when paint spraying indoors; however, alternatives are permitted when authorized by preventive medicine personnel. Table G-1, Technical Guide No. 144, must be reviewed to determine acceptable respiratory protection. In all cases the alternative respirator system must be approved for protection against contaminants at the levels documented.

a. Large vehicular or walk-in booths.

(1) If the diisocyanate concentration is below the standard, a full-facepiece organic vapor-cartridge respirator with a paint prefilter is adequate.

(2) If the solvent concentration is less than 10 times the standard, a full-facepiece organic vapor cartridge respirator with a HEPA (High-Efficiency Particulate Air) filter is required.

b. Spray cabinet or conveyer-type booths.

(1) If the contaminant (solvent, pigment, or diisocyanate) concentration is below the standard, no respiratory protection is required.

(2) If the diisocyanate concentration exceeds the standard, a supplied-air respirator is adequate.

(3) If the solvent concentration exceeds the standard, but is less than 10 times the standard, a full-facepiece organic vapor respirator with HEPA filter is required.

2. Spray Painting Outdoors.

a. If in a confined space, a pressure demand or continuous flow, type C, supplied air is required.

b. If not in a confined space, a supplied air respirator is still required, but solvent concentrations determine need for HEPA filter.

3. Brush or Roller Paint Indoors or Outdoors (open spaces).

A supplied air pressure demand or continuous flow, type C, respirator with auxiliary self-contained air supply.

4. Brush or roller paint indoors or outdoors in all confined spaces.

a. Spray operations. A supplied air pressure demand or continuous flow, type C, respirator with auxiliary self-contained air supply.

b. Brush/roller operations. A supplied air pressure demand or continuous flow, type C, respirator with auxiliary self-contained air supply; also approved alternative respiratory protection.

c. Application of a water base paint does not normally require respiratory protection; however, local preventive medicine/industrial hygiene personnel will determine the requirements.

NOTE 1: Approved respirators which provide more protection than the recommended device may be substituted in accordance with TB Med 502.

NOTE 2: A confined space, for the purpose of determining respiratory protection required during operations, is defined as:

A. General.

(1) Any area where dilution ventilation cannot take place or airflow is obstructed; or

(2) Under or in vehicles/equipment.

B. Indoors - Not in Spray Paint Booths.

(1) Less than 10,000 cubic feet; or

(2) Ceiling height less than 16 feet; or

(3) Touchup paint area contains partitions, balconies, or other structural barriers to the extent that they obstruct cross ventilation; or

(4) Outside air is not mechanically distributed at a minimum rate of 3.2 cfm per square foot of the bay/room/area where the touchup painting takes place.

C. Outdoors.

(1) Where two or more sides are blocked by building, partitions, or barriers; or

(2) Under a canopy or roof less than 16 feet in height.

Source: Office of the Surgeon General, DASG, PSP-O, Technical Guide No. 144, Guidelines for Controlling Health Hazards in Painting Operations, Aug 87.

## MATERIALS AND SUPPLIES USED IN CARC PAINTING OPERATIONS

Due to the number of solvents, thinners, and paints used within the Army, it is not possible to list all of them. Items that have a Federal Stock Number (FSN) can be located on the Department of Defense (DOD) Hazardous Materials Microfiche, DOD 6050.5-LR (can be ordered on publications requisition), in order to evaluate hazards, storage, and personal protective equipment requirements. If the material does not meet the description on the microfiche, is omitted from the microfiche, or is a local purchase item, hazardous materials safety data sheets should be obtained from the procurement source or manufacturer before using the chemical.

In accordance with 29 CFR 1910.1200, all workers are to have access to hazardous materials safety data sheets upon request on all chemicals used within the operation. It is the supervisor's responsibility to maintain this information and use it to be informed of proper procedures, hazards, and requirements for compliance.

## 1,1,1 Trichloroethane

Hazard class: ORM and poisonous substance.

Safety precautions: Store away from strong alkalis and avoid damaging containers. Never use welding or cutting torch near containers (even empty), they can ignite explosively.

Effects of overexposure:

- a. Eyes: Severe irritation.
- b. Skin: Irritation and prolonged exposure results in defatting of tissue.
- c. Inhalation: Nasal irritation, nausea, headaches.
- d. Ingestion: Gastrointestinal irritation, vomiting, diarrhea, and chemical pneumonitis.

Protective equipment: Polyethylene/pva gloves and chemical splash-proof goggles must be worn. Wear impervious clothing and boots to prevent skin contact. Mechanical ventilation is needed to keep vapor concentration within allowable limits. In concentrated areas, a self-contained breathing apparatus with full face piece in positive pressure is needed.

First aid: Contact medical assistance.

- a. Skin/eyes: Wash skin with soap and water. Flush eyes with plenty of water.
- b. Inhalation: Move person to fresh air, perform CPR if needed.
- c. Ingestion: Give water and induce vomiting immediately. Contact a physician.

Spills/disposal: Use absorbent material to clean up small spills and place in a closed metal container away from ignition or place under an evaporation hood. In large spills, evacuate area. Trained personnel in protective equipment should isolate spill and pump out large amounts of material. Residue should be cleaned with absorbent material and shoveled into metal containers. Dispose of in accordance with local, state, and Federal laws.

## Lead

(Contained in certain paints and dust from removal of old paint)

Hazard class: No hazard class, toxic substance under 29 CFR 1910.1025.

Safety precautions: Prevention of adverse health effects for most workers from exposure to lead throughout a working lifetime requires that worker blood-lead levels be maintained at or below 40 micrograms per 100 grams of whole blood. This level should be below 30 micrograms for personnel desiring children. Usual methods of control are by using proper protective equipment, health monitoring, ventilation, and hygiene to minimize exposure.

Methods of exposure: Lead can be absorbed into the body by inhalation (breathing) and ingestion (eating). When lead is scattered into the air as a dust it can be inhaled into the lungs. You can also absorb lead through the digestive system if it is eaten or swallowed. The most common methods for this are by handling food, cigarettes, chewing tobacco, and makeup, with lead-contaminated hands. Even though the worker may not be aware of any immediate symptoms of disease, the effects of lead are cumulative and lead stored in body tissues can slowly cause irreversible damage to the body.

Effects of overexposure:

a. Damage to blood forming, nervous, urinary and reproductive system, loss of appetite, metallic taste in mouth, nausea, headache, etc.

b. Brain encephalopathy, stupor, convulsions.

c. Kidney disease, urinary dysfunction, decreased hemoglobin.

d. Decreased sex drive, sterility, impotence, and increased likelihood of offspring with birth defects, mental retardation, behavioral disorders or death in the first year of life.

Protective equipment: Clean and dry coveralls, appropriate goggles and respirators, gloves, hand and face washing facilities, and medical surveillance. In cases where workers are exposed to lead above the permissible exposure limit, change rooms (all clothing is changed to include shoes and underwear), showers, and in some cases separate lunchrooms to prevent contamination of fellow workers and the family, home, and car of the lead worker.

First aid: There is no first aid for lead exposure. Damage to the body is not immediately correctable and usually is advanced before it is detected. The only first aid available is the proper use of protective equipment and taking steps to minimize exposure proactively (before it causes damage).

Aircraft Coating Thinner  
MIL-T-81772

Hazard class: Flammable liquid.

Materials/conditions to avoid: Strong oxidizers and sources of heat, spark, and ignition. Do not store above 120 F. Store in approved OSHA storage cabinets or buildings for class 1B liquids. Avoid freefall of liquid, and ground containers when pouring.

Effects of overexposure: Inhalation results in respiratory irritation and may cause headache, dizziness, staggering, confusion, or coma.

Protective equipment: If ventilation is adequate to maintain organic vapor within permissible exposure limits, no respiratory protection is needed. Excessive organic vapor concentrations require the use of a self-contained breathing apparatus. Local exhaust is preferable and mechanical ventilation is acceptable. Protective impervious gloves and chemical goggles should be worn. Clothing should be appropriate to minimize skin exposure.

First aid: Contact medical assistance.

- a. Skin/eyes: Flush with water for at least 15 minutes.
- b. Inhalation: Move out of vapor area and restore breathing.
- c. Ingestion: Get help immediately. DO NOT induce vomiting.

Spills/disposal: Remove all sources of ignition. Absorb with nonsparking inert materials. Dispose of in accordance with applicable regulation. Do not dump into drainage and water systems. Do not incinerate in closed containers.

Dichloromethane  
(Paint Remover)

Hazard class: ORM and poisonous substance.

Safety precautions: Avoid exposure to strong oxidizing agents and exercise caution when opening containers to prevent spurring of contents. Vapors are heavier than air and will travel along the ground to accumulate in low-lying areas. Use caution when entering these areas.

Effects of overexposure:

- a. Skin: Irritation and defatting of tissue.
- b. Eyes: Severe irritation and possible permanent damage.
- c. Inhalation: Headache, dizziness, and intoxication.

Protective equipment: Neoprene gloves and cup-type protective goggles are required. A neoprene solvent-resistant apron and boots should also be worn. Local exhaust ventilation should be used to keep vapors within allowable levels. In areas of high concentration, a self-contained breathing apparatus with positive pressure should be used.

First aid: Contact medical assistance.

- a. Skin: Wash with plenty of soap and water.
- b. Eyes: Flush with water for 15 minutes.
- c. Inhalation: Move to fresh air, give oxygen and CPR if needed.
- d. Ingestion: Give victim 1 quart of water and induce vomiting. Call a physician immediately.

Spills/disposal: Contain spillage and absorb with absorbent material. Store wastes in a covered drum for disposal or reclamation. Dispose of in accordance with local, state, and Federal regulations.

## Xylene

Hazard class: Flammable liquid.

Safety precautions: Do not store with strong oxidizing agents, strong acids, or strong bases. Keep containers cool, dry, and away from sources of heat, spark, and ignition. Provide adequate ventilation. Avoid breathing vapors and skin contact. Store in an approved storage cabinet or outside building for flammable liquids.

Effects of overexposure:

- a. Skin/eyes: Severe irritation.
- b. Inhalation: Respiratory tract irritation.
- c. Other side effects include nausea, vomiting, and liver and kidney damage in humans.

Protective equipment: Impervious protective gloves and safety chemical goggles are required when handling this material. Clothing and other items should be appropriate to prevent prolonged contact with the chemical. Mechanical exhaust should be used to keep vapor concentrations at allowable levels. In areas of high vapor concentration, an approved respirator for organic vapors should be used.

First aid: Contact medical assistance.

- a. Skin/eyes: Flush with large amounts of water for 15 minutes.
- b. Inhalation: Move victim to fresh air, give CPR and oxygen if needed.
- c. Ingestion: Rinse mouth and get medical assistance immediately.

Spills/disposal: Contain spill and absorb with absorbent material. Keep wastes and spilled chemical away from sources of heat, spark, and ignition. Dispose of in accordance with local, state, and Federal regulations.



Methylene Chloride  
(Often found in paint removers)

Hazard class: ORM and poisonous substance.

Safety precautions: Store in cool place and avoid breathing vapors.

Effects of overexposure: Contact with the skin or eyes is painful and will cause damage in a short time. Most common signs are nausea, numbness, dizziness, and disorientation. It is known to put a strain on the heart if breathed in excessive amounts.

Protective equipment: Rubber gloves and safety glasses are required when handling this material. When vapor concentrations are above allowable limits, personnel must wear respirators with organic vapor canister or self-contained breathing apparatus.

First aid: Contact medical assistance.

- a. Skin/eyes: Flush with water.
- b. Inhalation: Move to fresh air and perform CPR if needed.
- c. Ingestion: Induce vomiting and get medical attention.

Spills/disposal: Soak up small spills and use proper protective equipment. In large spills, evacuate area, contain liquid and transfer to closed metal containers. Keep out of water supply. Waste solvent should be sent to a reclaiming facility.

## Toluene

Hazard class: Flammable liquid.

Safety precautions: Keep away from strong oxidizers and sources of heat, spark, and open flames. Keep container tightly closed. Wash thoroughly after handling this material. Store in approved cabinet or storage building for class 1B flammable liquids.

Effects of overexposure:

- a. Inhalation: Dizziness, coma, respiratory failure.
- b. Skin/eyes: Moderate to severe irritation.

Protective equipment: Impervious gloves and chemical goggles are required. Full protective clothing, safety showers, and eyewash stations are required. Mechanical and local ventilation should be adequate to keep vapor concentration within allowable limits. If vapor exceeds allowable limits, an approved respirator for toluene must be worn.

First aid: Contact medical assistance.

- a. Skin/eyes: Flush with large amounts of water for 15 minutes.
- b. Ingestion: Rinse mouth and contact a doctor.
- c. Inhalation: Move victim to fresh air and perform CPR if needed.

Spills/disposal: Dispose as chemical waste. Incinerate or dispose of in accordance with local, state, and Federal regulations.

## Acetone

Hazard class: Flammable liquid.

Safety precautions: Avoid exposure to oxidizers, chloroform, alkalies, acids, and sources of heat, spark, and ignition. Keep in tightly closed containers in a cool, ventilated place. Do not store near heat or sunlight and avoid damage to container.

Effects of overexposure:

- a. Skin/eyes: Redness, irritation to respiratory system, headache.
- b. Inhalation: Irritation to respiratory system, headache.

Protective equipment: Impervious gloves and safety goggles or face shield are required. Full protective clothing, eyewash, and deluge shower are also recommended. Local ventilation should be adequate to keep vapor concentration within allowable limits. Otherwise, workers should wear a self-contained breathing apparatus or gas mask.

First aid: Contact medical assistance.

- a. Skin/eyes: For skin exposure, remove contaminated clothing and wash with plenty of soap and water. Flush eyes with large amounts of water.
- b. Ingestion: Give two large glasses of water and induce vomiting. If unconscious, give nothing by mouth.
- c. Inhalation: Move victim to fresh air and give CPR and oxygen if needed.

Spills/disposal: Small spills can be absorbed with sand or other nonstatic material and then placed into closed metal containers away from sources of heat, spark, and ignition. Large spills should be contained. Large amounts of liquids should be pumped out and the remainder absorbed with sand. Do not dump waste into drainage system. Send waste for recovery or disposal in accordance with local, state, and Federal regulations.

**SAMPLE JOB SAFETY  
BREAKDOWN SHEETS**

These Sample Job Safety Breakdown Sheets may be used to prepare similar analysis of local operations. Although modification is necessary to suit individual needs, the samples provide a workable method of safety evaluation and job/task analysis.

JOB SAFETY BREAKDOWN SHEET  
SAMPLE

INSTRUCTION UNIT:	OPERATION:	JOB:
Painters	(CARC) Spray Painting	Painting
STEPS	KEY POINTS	SAFETY INSTRUCTIONS
1. Inspect and Prepare Working Area	a. Inspect paint booth and area	Assure lights are on.*
	b. Sprinkler heads	Check sprinkler heads, assure that each is covered with tissue.
	c. Paint filters	Check booth paint filters for cleanliness; assure that all are in place.*
	d. Exhaust system	Turn on and assure exhaust system is operative by observing flow indicators.*
	e. Paint booth	Remove all debris and extra material within booth and around outside.
	f. Fire extinguisher	Check fire extinguisher for charge.*
	g. Doors	a. Close booth doors during operations.  b. All spray painting will be with the lowest possible air necessary to provide the proper covering.  c. Spraying will be done as close to the center of the booth as possible. Take care not to overspray.  d. Spraying areas that are equipped with doors must have all doors closed and secured prior to painting, mixing, or cleaning up.
2. Equipment	a. Respirator protection	a. An approved pressure demand or continuous flow, type C, full-facepiece hood or helmet supplied air respirator must be worn; assure hood is secure and

JOB SAFETY BREAKDOWN SHEET  
SAMPLE

INSTRUCTION UNIT:	OPERATION:  (CARC) Spray Painting	JOB:  Painting
STEPS	KEY POINTS	SAFETY INSTRUCTIONS
		<p>well-fitting, assure proper air supply.</p> <p>b. Hood-type respirators will be worn by all personnel for spray paint operations. All employees will have appropriate physical examinations prior to use of respirators for CARC painting.</p> <p>c. All employees wearing air line respirators will be properly trained in use and care of the respirators.</p>
	b. Foot protection	<p>a. Safety shoes are required and must be worn. Assure they are in good repair.</p> <p>b. Personal protective equipment will include: coveralls with collars buttoned and sleeves taped at wrists and ankles. Gloves and safety shoes are required and must be in reliable condition with no holes or paint-soaked areas. Barrier cream will be used on all skin areas not covered with protective clothing and equipment.</p>
	c. Coveralls	Coveralls must be worn for complete body cover when painting with CARC paint.
	d. Gloves	Gloves must be worn. Assure gloves are free of holes and not paint-soaked.
	e. Tools	Assure that all tools are clean and in good condition.

JOB SAFETY BREAKDOWN SHEET  
SAMPLE

INSTRUCTION UNIT:	OPERATION:	JOB:
Painters	(CARC) Spray Painting	Painting
STEPS	KEY POINTS	SAFETY INSTRUCTIONS
3. Material	a. Paint and ventilation	<p>a. Mix and thin paint, when required, inside paint booth. Assure complete body cover and air line respirator are used when mixing paint. Assure that all containers are static-bonded and grounded. Ventilation shall be on during mixing operations. Allow ventilation system to remain operating for 30 minutes after spraying is completed to allow vapors to dissipate.</p> <p>b. All protective clothing and equipment will be worn while mixing and painting, regardless of the amount. All mixing and spraying will take place within the booth, with the exhaust ventilation operating.</p> <p>c. All cleanup will be completed only within the confined space where the ventilation system is running.</p> <p>d. All pots will be adequately grounded. Grounding will be maintained during flushing by holding gun to the side of the grounded container.</p>
	b. Dispose of paint	Any unused paint at the end of shift will be disposed of by prescribed manner.
	c. Items to be painted	Assure that all items are securely placed or chocked to prevent movement while painting.
4. General	a. Lifting	Lift in the prescribed manner to avoid back strain and hernia.



JOB SAFETY BREAKDOWN SHEET  
SAMPLE

INSTRUCTION UNIT:	OPERATION: (CARC) Spray Painting	JOB: Painting
STEPS	KEY POINTS	SAFETY INSTRUCTIONS
		Place feet solid; bend at the knees; keep back straight; grasp item with both hands keeping same close to body and lift with leg muscles. Ask for help with anything that is too heavy to lift alone.
	b. Personal hygiene	Wash hands and face thoroughly with soap and water before eating lunch and/or breaks.
	c. Existing regulations	a. When in doubt where safety and fire problems arise, consult your supervisor. No unprotected worker will be allowed to be in the paint or dry booth during or after painting.  b. No unauthorized/unprotected personnel will be allowed in the designated area while operations are in progress.
	d. Personal contact	a. If paints come in contact with hands do not use thinner to remove.  b. All accidents, unsafe conditions or incidents, personnel injuries or suspected exposure will be reported to the supervisor immediately.

\*Any defects and/or malfunctions should be reported to your supervisor so that corrective actions can be initiated.

KNOW WHAT YOU'RE WORKING WITH . . . .

MATERIAL SAFETY DATA SHEET

FLAMMABLE  
CARCINOGEN  
PROTECTIVE EQUIPMENT  
STORAGE  
DISPOSAL

DON'T BE CARELESS WITH CARC